

CHAPTER 8

ENTANGLEMENTS

This chapter provides information about the construction and use of wire entanglements.

BARBED-WIRE ENTANGLEMENTS

Barbed-wire entanglements are artificial obstacles designed to slow the movement of foot troops and, in some cases, tracked and wheeled vehicles. The materials used in constructing barbed-wire entanglements are relatively lightweight and inexpensive, considering the protection they afford. You can breach barbed-wire entanglements by fire but they are built, repaired, and reinforced rapidly.

SITE AND LAYOUT

To be effective, you should select the site and lay out barbed-wire entanglements to meet the following requirements:

1. Perform the work under friendly observation, covered by fire, and where practicable, protected by antipersonnel mines, trip flares, and warning devices.
2. Conceal the entanglements from enemy observation as far as practicable by incorporating terrain features, such as reverse slopes, hedges, woods, paths, and fence lines.

3. Erect them in irregular and nongeometrical traces.

4. Use them in bands or zones wherever practicable.

5. Coordinate the entanglements with other elements of the defense.

CLASSIFICATION

You should classify entanglements according to use and depth and whether they are fixed or portable. They are classed by use as tactical, protective, or supplementary. The use of these types of entanglements in a defensive area is shown schematically in figure 8-1.

Tactical-Wire Entanglements

Establish tactical-wire entanglements parallel to and along the friendly side of the final protective line. Use them to breakup enemy attack formations and to hold the enemy in areas covered by the most intense defensive fire. Extend tactical entanglements across the entire front of a position, but you need not make them continuous.

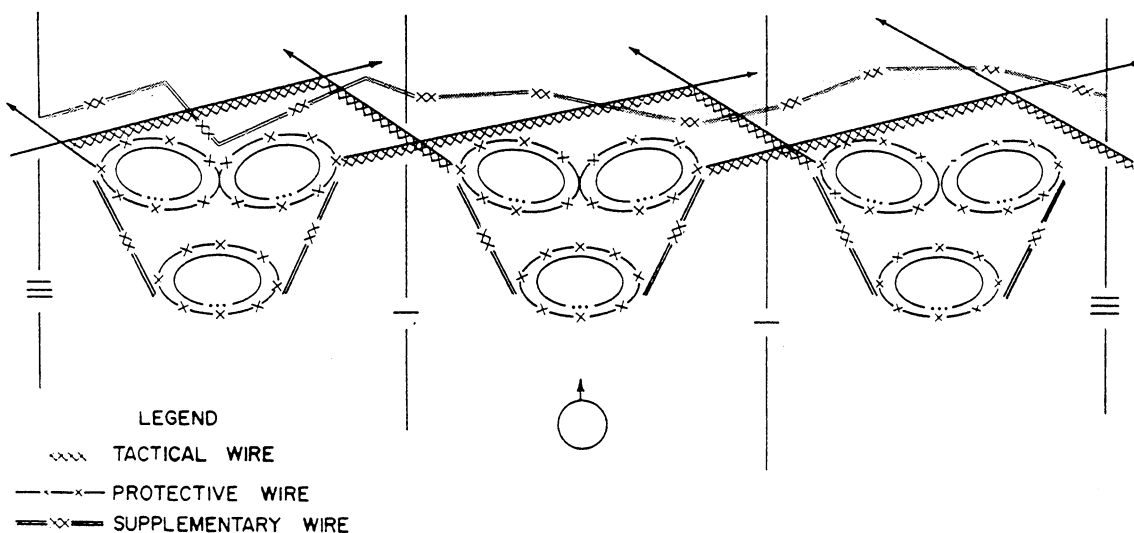


Figure 8-1.-Schematic layout of barbed-wire entanglements in a defensive area.



Figure 8-2.—Protective wire on top of overhead cover.

Protective-Wire Entanglements

Locate protective-wire entanglements to prevent surprise assaults from points close to the defense area. As with all antipersonnel obstacles, they are close enough to the defense area for day-and-night observation. They are also far enough away to prevent the enemy from using hand grenades effectively from points just beyond the obstacle, normally 131 to 328 feet. Surround the individual units of a command, usually the platoon (fig. 8-1), with protective wire. Connect these entanglements to entanglements around other platoons by supplementary wire to enclose the entire defensive positions. Erect protective entanglements around rear-area installations in the same manner to serve the same purpose as protective wire around defensive positions in forward areas. You should also include the entanglements of protective wire over the tops of installations provided with overhead cover (fig. 8-2).

Supplementary-Wire Entanglements

Use supplementary-wire entanglements in front of the forward edge of the battle area (FEBA) to conceal

the exact line of the tactical wire. To the rear of the FEBA, use supplementary wire to enclose the entire defensive position by connecting the protective-wire entanglements. Use supplementary-wire entanglements to break up the line of tactical wire. These supplementary-wire entanglements should be identical to the tactical-wire entanglements and constructed simultaneously with them whenever possible.

Depth of Entanglements

You should classify entanglements by depth as belts, bands, or zones.

A BELT is an entanglement one fence in depth.

A BAND consists of two or more belts in depth, with no interval between them. The belts may be fences of the same type, or the band may be composed of two or more fences of different types.

A ZONE consists of two or more bands or belts in depth with intervals between them.

Equivalent Effectiveness

You should describe or specify entanglement depths in terms of comparative effectiveness. Use tactical-wire entanglements with an equivalent in effectiveness to three belts of 4- and 2-pace double-apron fence whenever possible. Use protective wire in any type of entanglement provided its effectiveness is at least the equivalent of the 4- and 2-pace double-apron fence. Use supplementary wire with an effectiveness equivalent to that of the type of wire it supplements. It should be equivalent to tactical wire or equivalent to the type of protective wire being used if it connects the outer perimeters of protective wire at the flanks and rear.

Portability

By definition, fixed entanglements are erected in place and they cannot be moved unless completely disassembled.

Conversely, you can move portable entanglements without complete disassembly. Portable entanglements have been developed for one of the following reasons:

- To permit assembly in rear areas with ease of transportation and rapid installation in forward positions
- For the temporary closing of gaps or lanes that can be reopened quickly for patrols or counterattacking forces

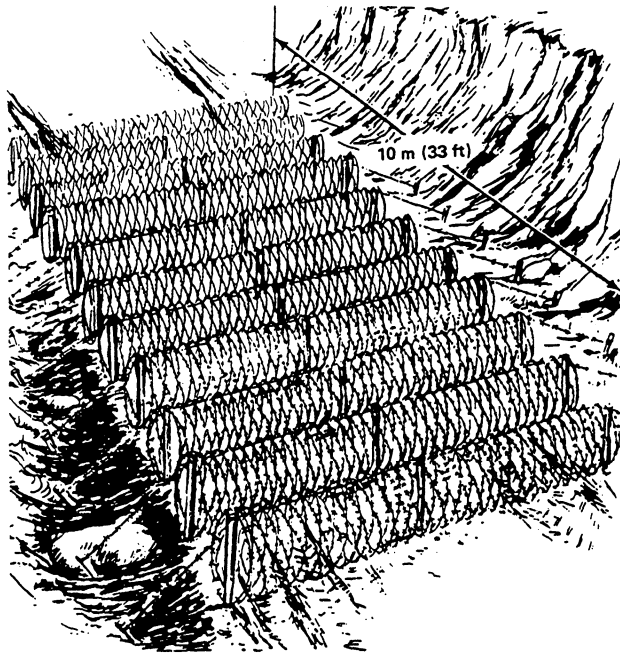


Figure 8-3.—Concertina roadblock.

Lanes and Gaps

Provide lanes and gaps for the passage of patrols, working parties, and attacking or counterattacking forces. When they are not in use, keep them closed with portable obstacles covered by fire. In barbed-wire zones, stagger lanes and gaps in a zigzag pattern.

USES OF BARBED-WIRE ENTANGLEMENTS

The uses of barbed-wire entanglements are listed below.

Outpost Area

Surround combat outposts with wire entanglements. Site these entanglements carefully to serve as both protective and tactical wire, and cover them by small-arms fire. Supplement the wire obstacles with antipersonnel mines, warning devices, and booby traps.

Battle Position

In the battle area, surround each company defense position with a wire entanglement that is connected laterally across the front of the entanglements surrounding the other units in the position.

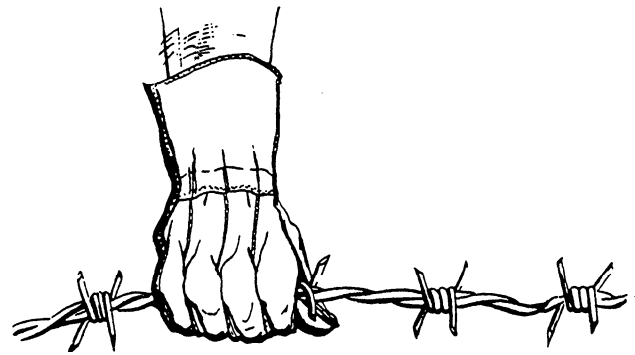


Figure 8-4.—Standard barbed wire.

Artillery and Reserve Area

Use wire entanglements in the outer protection areas of howitzer positions. Similarly, protect heavier weapons, reserve area shelters, and other installations in the reserve area if justified by the situation.

Antipersonnel Obstacles

Site barbed-wire entanglements, trip flares, noisemakers, and antipersonnel mines to detect enemy patrol action or infiltration at night; to prevent the enemy from delivering a surprise attack from positions close to the defenders; and to hold, fix, or delay the enemy in the most effective killing ground. Site such obstacles near enough to defensive positions for adequate surveillance by the defenders by night and day and far enough away to prevent the enemy from using hand grenades against the defender from points just beyond the obstacles.

Roadblocks

Figure 8-3 shows a series of barbed wire concertinas that will stop wheeled vehicles. Use a series of these blocks placed about 33 feet apart. Wire together the ends of adjacent coils and lightly anchor the obstacle at the sides of the road. Site the block to achieve surprise.

Strengthening Natural Obstacles

Deep rivers, canals, swamps, and cliffs are effective delaying obstacles to infantry. Thick hedgerows, fences, and woods can slow troops to a lesser degree. You can improve both of them by lacing the obstacles with barbed wire, by the addition of parts of standard fences on one or both sides, or by entangling with loose wire.

STANDARD BARBED WIRE

Standard barbed wire is a two-strand twisted No. 12 steel wire with four-point barbs at 4-inch intervals (fig. 8-4).

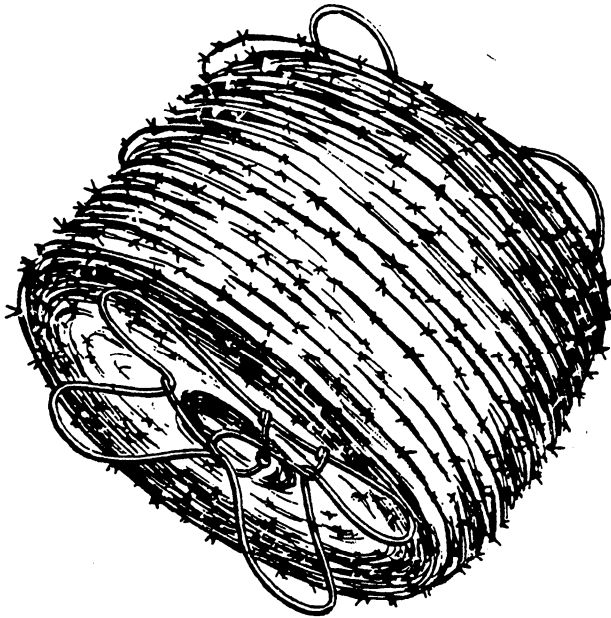


Figure 8-5.—Barbed-wire reel.

Handling

When handling barbed wire, wear the standard barbed-wire gauntlets shown in figure 8-4 or heavy leather gloves. They permit faster work and protect against cuts and scratches. As an added safety precaution, grasp the wire with your palms down.

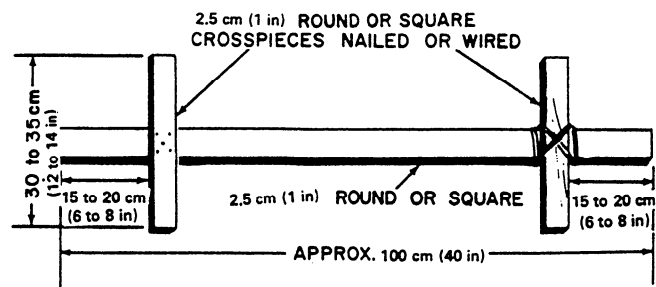
Issue

Barbed wire is issued in reels (fig. 8-5), containing about 1,312 feet of wire. The wire weighs 90 pounds and the reel about 1.3 pounds. When a fence is being built, two men carry one reel.

Bobbins

Bobbins (fig. 8-6) holding about 98 feet of wire are prepared, normally in rear areas, for use in building short lengths of fence and in repairing entanglements. When bobbins are used, two men handle one bobbin. One unwinds the bobbin and the other installs the wire. Two or more men can make the bobbins by following these steps:

1. Prepare the bobbin sticks.
2. Rig the reel on an improvised trestle or other Support.
3. Have one man unroll and cut 98-foot lengths of wire, fastening one end of each to the trestle.



① METHOD OF MAKING BOBBIN



FREE END MARKED WITH WHITE TAPE
② COMPLETED BOBBIN

Figure 8-6.—Barbed-wire bobbin.

4. Wind the wire in a figure-eight shape on the bobbin sticks.

5. Tie a piece of white tracing tape to the loose end of the wire to facilitate finding it.

BARBED-STEEL TAPE

The physical characteristics of barbed-steel tape (fig. 8-7) are as follows:

Width: 3/4 inch

Thickness: 0.022 inch “

Weight: 4,438 pounds/164 feet

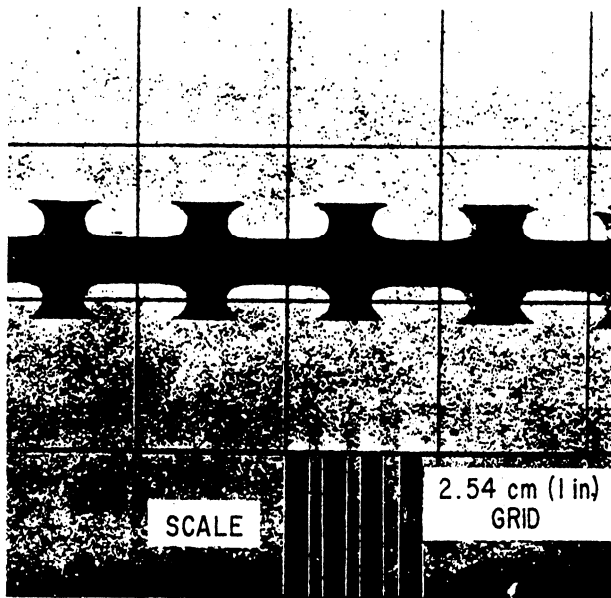
Width of barb: 7/16 inch

Interval between barbs: 1/2 inch

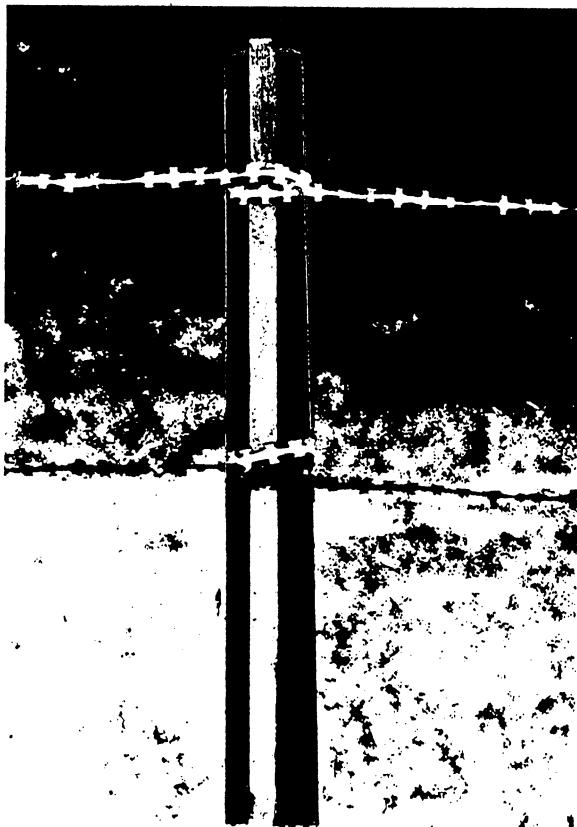
Breaking load: 500 pounds

Two significant characteristics listed above that are important to field users are the weight and the breaking load. A comparison of pertinent characteristics of barbed tape and barbed wire is shown below.

| <u>CHARACTERISTIC</u> | <u>BARBED TAPE</u> | <u>BARBED WIRE</u> |
|-----------------------|---------------------------------|-----------------------|
| Weight (1,312 feet) | 35.5 pounds | 104.5 pounds |
| Breaking load | 270.0 pounds | 1,075.0 pounds |
| Barbed interval | 1/2 inch | 4 inches |
| Size (9,900 feet) | 18 5/8 x 19 1/2 x 17 1/2 inches | 23 inches |
| cube | 3.6 feet ² | 9.7 feet ² |



BARBED STEEL TAPE



WRAP-AROUND TIE

Figure 8-7.—Barbed-steel tape.

Handling

In handling barbed tape, use heavy barbed-tape gauntlets instead of the standard gauntlets (fig. 8-8). Small metal clips on the palm and fingers prevent the

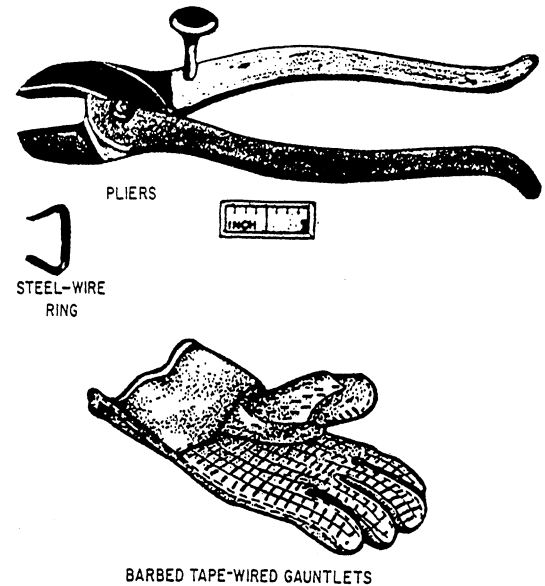


Figure 8-8.—Barbed-tape equipment.

barbs of the tape from cutting the leather. Barbed tape is lightweight and compact, and it is much easier to handle, store, and transport than barbed wire.

Issue

The barbed tape is issued in a 164-foot reel that weighs about a pound. There are six reels to a cardboard carrying case.

Barbed Tape Dispenser

A dispenser (fig. 8-8) is required to install barbed tape. It consists of a frame to hold the 164-foot reel of barbed tape and two sets of rollers. Insert the reel on the spindle and thread the tape through the two sets of parallel rollers. Then turn the outside set of rollers 90 degrees in a clockwise direction. Now close the hinged arm of the frame and lock it in place by the frame of the rotating rollers. As the tape unwinds from the reel, the two sets of rollers oriented 90 degrees to each other

impart a twist to the tape. For it to be effective, you must twist the barbed tape as it is installed.

Uses

You can use barbed tape in place of standard barbed wire in most all cases except when it is to be repeatedly recovered and reused. The most effective fence you can construct using barbed tape is the “Double-Apron Fence” (discussed below).

ADVANTAGES OF BARBED TAPE.— The principal advantages of barbed tape are its size and weight. For equal lengths, barbed tape occupies a third of the space and weighs a third as much as standard barbed wire. A double-apron fence constructed with barbed tape is more difficult to breach by crawling through than one constructed with standard barbed wire because the barbs of the barbed tape are closer together. Because of the flat configuration, it is more difficult to cut barbed tape with wire cutters.

DISADVANTAGES OF BARBED TAPE.— At the present time, the major disadvantage of barbed tape is its breaking strength. Standard barbed wire is twice as strong. Installation of barbed tape requires a dispenser. A major problem could arise if the dispenser is not available. The tape is not recoverable to its original condition. However, it maybe recovered on bobbins in a twisted condition. Barbed tape is more easily cut by shell fragments than standard barbed wire. Barbed tape can also be cut with a bayonet.

Double-Apron Fence

The standard double-apron fence is one of the best obstacles that can be made with barbed tape. The effectiveness of this obstacle is increased by (1) raising the top wire to preclude crossing the obstacle by stepping over it and (2) placing low wires 4 inches above the ground to prevent personnel from crawling under the obstacle.

Tying Procedures

In tying barbed tape, use the wraparound tie (fig. 8-7), since the sharp bends of other ties weaken the tape. Steel-wire rings, crimped on, provide effective ties and may be used where available (fig. 8-8).

Splices

Connecting slots at each end of a 164-foot reel provide a quick method of splicing reels of barbed tape

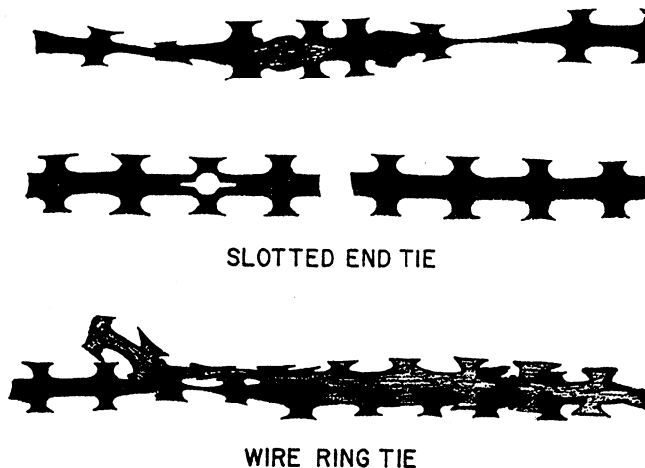


Figure 8-9.—Splicing barbed-steel tape.

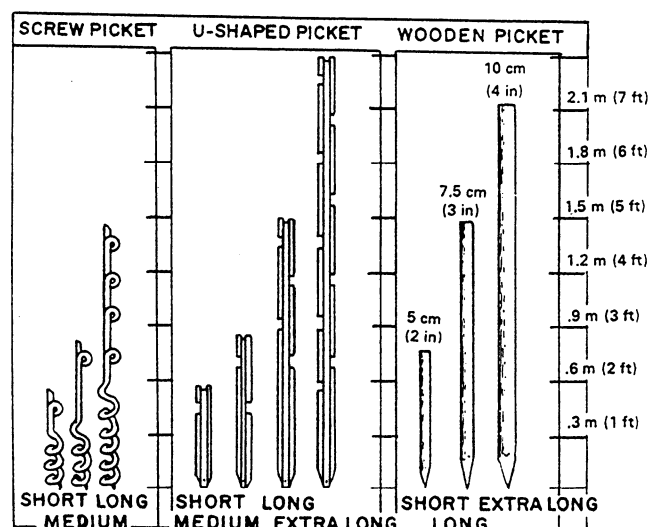


Figure 8-10.—Pickets for use with barbed wire.

(fig. 8-9). You can also splice barbed tape by interlocking the twisted barbs of two separate lengths, then completing the splice by affixing one steel-wire ring to each end of the area where spliced (fig. 8-9).

METAL PICKETS

Metal pickets are issued in two types: screw and U-shaped. The standard lengths are short (or anchor), medium, and long (fig. 8-10). The U-shaped picket also comes in an extra-long length. Pickets that are serviceable can be recovered and used again.

Screw Pickets

Drive the screw picket into the ground by turning it in a clockwise direction using a driftpin, stick or another

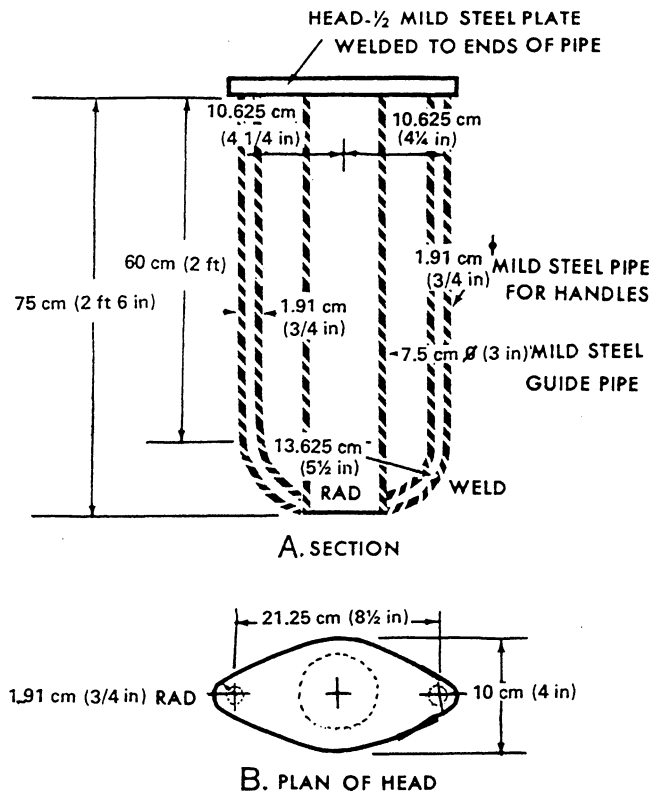


Figure 8-11.-Expedient picket driver.

picket inserted in the bottom eye of the picket for leverage. Use the bottom eye in order to avoid twisting the picket. Install screw pickets so the eye is to the right of the picket, as seen from the friendly side, and standard ties can be made easily. Screw pickets tend to be less rigid than other types but are desirable because you can install them rapidly and silently. When silence is necessary, wrap the driftpin used in installing the pickets with cloth.

U-shaped Pickets

The U-shaped picket is a cold-formed steel picket with a U-shaped cross section, pointed at one end for driving. It is notched for wire ties and the pointed end has a punched hole for wires used in bundling the pickets. Drive the U-shaped pickets with a sledgehammer. Use a stake driving cap on the tip of the picket to prevent the sledge from deforming it. Driving the pickets is noisier than installing screw pickets. However, you can reduce the noise by placing a piece of rubber tire over the driving face of the sledge. The pickets are rigid and sturdy when installed properly. They are preferable to screw pickets in situations where noise is not a disadvantage and time is available. Drive the pickets

with the hollow surface (concave side) facing the enemy, so friendly small-arms fire will not ricochet back toward your position. An expedient picket driver, which can be fabricated locally, is shown in figure 8-11. Constructed as shown, it weighs approximately 5 1/2 pounds and is operated by two men. One man holds the picket in a vertical position, and the other slides the driver over the picket and drives it into the ground. Then both men work the picket driver up and down until the required depth is reached. Drive short pickets by turning the picket driver upside down and using the head as a hammer. Use the bucket of a front-end loader to push U-shaped pickets into the ground when the tactical situation permits the use of equipment.

In locations where frozen ground prevents driving of the U-shaped pickets, use an Arctic adapter. The adapter is made of steel and consists of a baseplate equipped with an adjustable channel receptacle and two anchor pins. Anchor it by driving the anchor pins through holes in the baseplate into the ground. One anchor-pin drive sleeve with a driving pin is provided with each 20 adapters to aid anchor pin emplacement. When adapters are not available, start a hole with a picket. The picket can be frozen in place by pouring water and snow into the hole.

WOODEN PICKETS

You can use expedient wooden pickets of several types.

Cut round poles 4 inches in diameter to standard picket lengths, sharpen them on one end, and drive them with a maul. Use the pickets without peeling the bark to prevent the wire from sliding on the picket and to simplify camouflage. You need longer pickets in loose or sandy soil and when driving through a snow cover. Driving wooden pickets is not as noisy as driving steel pickets, and you can reduce the noise further by fastening a section of tire tread over the face of the hammer or maul. For driving in hard earth, wrap the picket tops with wire to avoid splitting. Hardwood pickets, properly installed, are sturdy and rigid.

You can use dimensional lumber that is ripped to a square cross section instead of round poles. This is equally satisfactory except that it is more difficult to camouflage. These pickets may be dipped in camouflage paint before driving.

Standing trees and stumps may be used as pickets when their location permits.

Table 8-1.—Wire and Tape Entanglement Materials

| Material | Approximate weight | | Approximate length | | No. carried by one man | Approximate weight of man-load | |
|---------------------------------------|--------------------|-----------|--------------------|------|------------------------|--------------------------------|-------|
| | kg | lb | meters | feet | | kg | lb |
| Barbed wire reel..... | 41.5 | 91.8 | 400 | 1312 | 1/2 | 21 | 46 |
| Bobbin..... | 3.5- 4.0 | 7.7- 8.8 | 30 | 98 | 4-6 | 14.5-24.5 | 32-54 |
| Barbed tape dispenser..... | 0.77 | 1.7 | 0.45 | 1.5 | 20 | 15.5 | 34 |
| Barbed tape carrying case..... | 14.5 | 31.9 | 300 | 984 | 1 | 14.5 | 32 |
| Standard barbed tape concertina..... | 14 | 31.8 | 15.2 | 50 | 1 | 14 | 31 |
| Standard barbed wire concertina..... | 25.4 | 55.8 | 15.2 | 50 | 1 | 25 | 55 |
| Expedient barbed wire concertina..... | 13.5 | 29.7 | 6.1 | 200 | 1 | 13.5 | 30 |
| Screw pickets: | | | | | | | |
| Long..... | 4 | 8.8 | 1.6 | 5.25 | 4 | 16.3 | 36 |
| Medium..... | 2.7 | 5.9 | 0.81 | 2.66 | 6 | 16.3 | 36 |
| Short..... | 1.8 | 3.9 | 0.63 | 1.75 | 8 | 14.5 | 32 |
| U-shaped pickets: | | | | | | | |
| Extra long..... | 7.25 | 16 | 2.4 | 7.9 | 3-4 | 21.8-29.0 | 26-64 |
| Long..... | 4.5 | 9.9 | 1.5 | 4.9 | 4 | 18.1 | 40 |
| Medium..... | 2.7 | 5.9 | 0.81 | 2.66 | 6 | 16.3 | 36 |
| Short..... | 1.8 | 3.9 | 0.61 | 2.0 | 8 | 14.5 | 32 |
| Wooden pickets: | | | | | | | |
| Extra long..... | 7.7-10.5 | 16.9-23.1 | 2.13 | 7.0 | 2 | 15.4-20.8 | 34-46 |
| Long..... | 5.4- 7.25 | 11.8-15.9 | 1.5 | 4.9 | 3 | 16.3-21.7 | 36-48 |
| Short..... | 1.4- 2.7 | 3- 5.9 | 0.75 | 2.5 | 8 | 11.0-21.7 | 24-48 |

Table 8-1 lists information pertaining to materials used in the construction of barbed-wire entanglements.

CONCERTINA FENCING ENTANGLEMENTS

The standard barbed wire concertina (fig. 8-12) is a commercially manufactured barbed-wire obstacle made

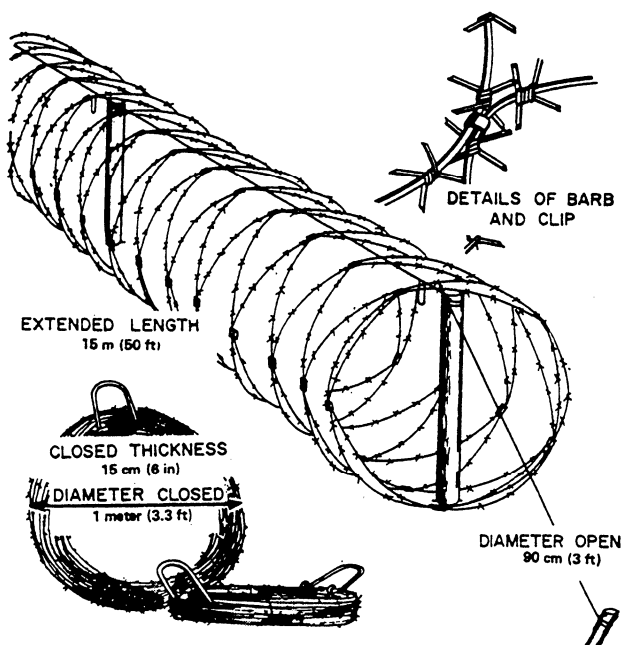


Figure 8-12.—Standard barbed-wire concertina.

of a roll of single-strand, high-strength, spring-steel wire with four-point barbs attached at 2-inch intervals. Wires forming the coils are clipped together at intervals so the concertina opens to a cylindrical shape 16.4 to 49.2 feet long (depending on structure and build of opening) and 3 feet in diameter. The 16.4-foot length prevents smaller enemy personnel from crawling through the wire because the coils are closer together. Use tanglefoot (discussed later in this chapter) in conjunction with the wire to further increase the effectiveness of the barrier. The concertina is opened and collapsed easily, and it can be used repeatedly. The wire is much harder to cut than standard barbed wire. The concertina weighs about 11 1/2 pounds.

HANDLING

The collapsed concertina is tied with plain-wire bindings attached to the quarter points of a coil at one end of the concertina. When opening the concertina, remove these bindings and twist them around the carrying handle for use in retying the concertina when it is again collapsed. You need four men to open a concertina and to extend it to the 16.4- to 49.2-foot length. Place one man to work at each end and the other two spaced along its length to ensure that it opens and extends evenly. When necessary, two men can easily open a concertina by bouncing it on the ground to prevent snagging as they open it.

Table 8-2.-Material and Labor Requirements for **984-Foot Sections** of Various Barbed-Wire Entanglements

| Type of entanglement | Pickets | | | | Barbed wire No. of 400 m, 41.5 kg reels ¹ | No. of concertinas ⁴ | Staples | Kg of materials per lin m of entanglement ⁵ | Lb of materials per lin m of entanglement ⁵ | Man-hours to erect 300 m of entanglement ³ |
|---|---------------|------|--------|-------|--|------------------------------------|---------|---|---|--|
| | Extra long | Long | Medium | Short | | | | | | |
| Double-apron, 4- and 2- pace | | 100 | | 200 | 14-15 (19) ⁶ | | | 4.6 (3.5) ⁶ | 10 (7.7) ⁶ | 59 |
| Double-apron, 6- and 3- pace | | 66 | | 132 | 13-14 (18) ⁶ | | | 3.6 (2.6) ⁶ | 8 (5.7) ⁶ | 49 |
| High wire (less guy wires) | | 198 | | | 17-19 (24) ⁶ | | | 5.3 (4.0) ⁶ | 11.6 (8.8) ⁶ | 79 |
| Low wire, 4- and 2-pace 4-strand fence | | 100 | 100 | 200 | 11 (15) ⁵ | | | 3.6 (2.8) ⁶ | 7.9 (6.1) ⁶ | 49 |
| Double expedient concertina | | 100 | | 2 | 5- 6 (7) ⁵ | | | 2.2 (1.8) ⁶ | 4.8 (3.9) ⁶ | 20 |
| Triple expedient concertina | | 101 | | 4 | 3 | 100 | 295 | 6.9 | 15.1 | 40 |
| Triple standard concertina | 51 | 101 | | 7 | 4 | 148 | 295 | 10.4 | 22.8 | 99 |
| Triple standard concertina | | 160 | | 4 | 3 (4) ⁶ | 59 | 317 | 7.9 (5.4) ⁶ | 17.3 (11.8) ⁶ | 30 |

¹ Lower number of reels applies when screw pickets are used; high number when U-shaped pickets are used. Add difference between the two to the higher number when wood pickets are used.

² Average weight when any issue metal pickets are used.

³ Man-hours are based on the use of screw pickets. With the exception of the triple-standard concertinas, add 20 percent to the man-hours when driven pickets are used. With experienced troops, reduce man-hours by one-third. Increase man-hours by 50 percent for nightwork.

⁴ Based on concertinas being made up in rear areas and ready for issue. Once expedient concertina opens to 19.7 ft length, as compared with 15 meters for a standard concertina; it requires 302 feet of standard barbed wire, also small quantities of No. 16 smooth wire for ties.

⁵ Number of 984 ft, 14.5 kg barbed tape carrying cases required if barbed tape is used in place of barbed wire.

⁶ Kgs of materials required per linear meter of entanglement if barbed tape is used in place of barbed wire and barbed tape concertina is used in place of standard barbed wire concertina.

Two men can collapse a concertina in the following manner:

1. First, remove all the kinks in the coils.
2. Tighten or replace the loose clips with plain wire.
3. Station one man at each end of the concertina and have them place one foot at the bottom of the coil and one arm under the top of the coil to close it.
4. Now, have two men walk toward each other closing the concertina as they go by feeding the wire over their arms and against their feet.
5. After closing, lay the concertina flat and compress it with your feet.
6. The the concertina with plain-wire bindings.

One man can carry the collapsed concertina by stepping into it and picking it up by the wire handles attached to the midpoints of an end coil.

Use improvised staples, approximately 18 inches long and made of 1/2-inch driftpins or similar material, to fasten the bottoms of concertina fences securely to the ground.

Barbed-tape concertina comes in a diameter of 33 inches and an expanded length of 50 feet. It is formed of barbed tape wrapped around a high-strength,

spring-steel, core wire. Its configuration, method of handling, and method of employment are similar to standard barbed-wire concertina. One roll weighs 31 pounds.

ORGANIZATION OF WORK

Table 8-2 lists the materials and man-hours required to assemble various entanglements. The normal sizes of work crews are listed in the descriptions of the entanglements. For each construction project, the senior petty officer divides his crew into groups of approximately equal size, based on his knowledge of the skill and the speed of each man. He organizes them in such a way that construction proceeds in proper order and at a uniform rate. Each individual must know exactly what his group is to do and his job in the group. Each man should have barbed wire gauntlets. The sequence of operations for each fence is given in the paragraph describing the erection of the fence. Follow the sequence outlined, and as you gain experience, you may vary the size and composition of the work groups. For each section of entanglement, all fence-building operations normally proceed from right to left, as one faces the enemy. It may, however, be necessary to work from left to right. Men should, as time permits, be taught to work in either direction. In case of heavy casualties, the senior officer or petty officer decides what wires, if any, are to be omitted.



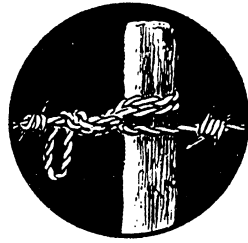
TOP-EYE TIE



INTERMEDIATE-EYE TIE



APRON TIE



POST TIE

Figure 8-13.—Ties for erecting entanglements as seen from the friendly side.

For night construction, make the following additional preparations:

1. Lay tracing tape from the materials dump to the site of work and then along the line of fence where possible.

2. Tie materials together in man loads and pickets, bundled tightly to prevent rattling.

3. Remove and replace wire fastenings of wire coils and pickets with string that can be broken easily.

4. Tie a piece of tape to the ends of the wire on each reel or bobbin.

Proper supervision of entanglement construction includes the following:

1. Organizing the work into tasks
2. Ensuring the tasks are carried out in proper sequence
3. Preventing bunching and overcrowding of personnel
4. Ensuring the wires are tightened properly and spaced correctly
5. Checking ties to see they are being made correctly and at the right points

When the enemy is in close proximity, the necessary precautions include the following:

1. Providing security around the work party.
2. Maintaining silence.

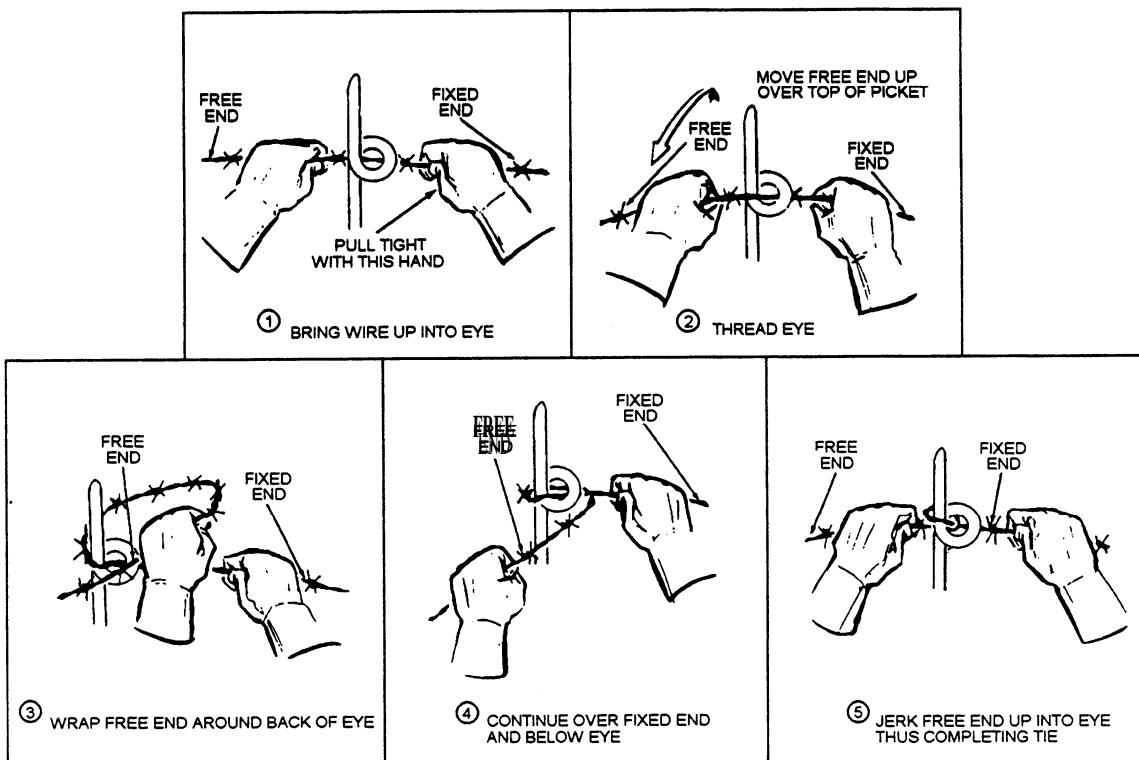


Figure 8-14.—Top-eye tie.

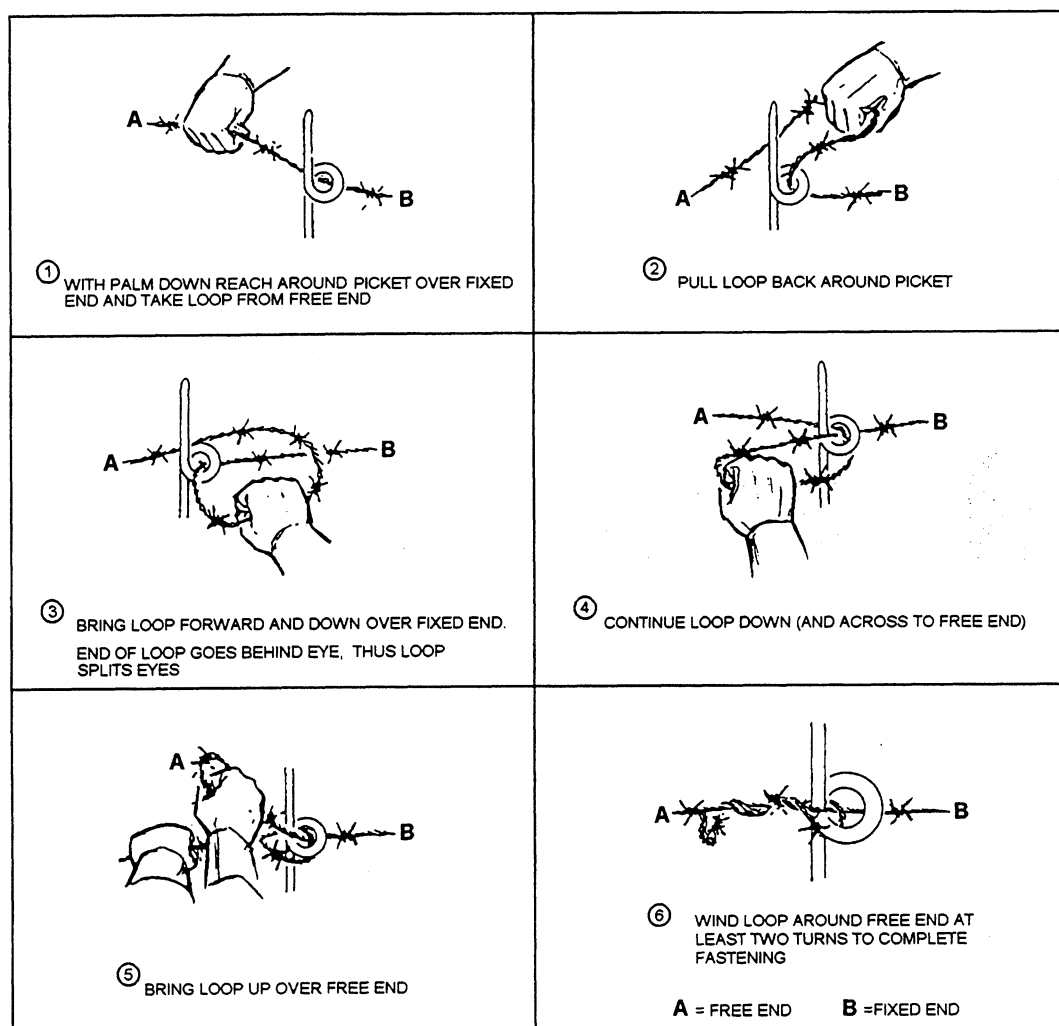


Figure 8-15.—Intermediate-eye tie.

3. No working on the enemy side of the fence unless absolutely necessary.

4. Using screw pickets, when available.

5. Men that are not working should lie down near the start of work until they can continue their work

6. Keeping individual weapons nearby at all times.

TIES FOR ASSEMBLING ENTANGLEMENTS

Wires are tied to pickets by men working from the friendly side of the wire and picket, stretching the wire with the right hand as the tie is started. The four ties used in erecting wire entanglements are shown in figure 8-13.

Top-Eye Tie

Use the top-eye tie to fasten standard barbed wire to the top eye of the screw pickets. Make the top-eye tie

with one continuous movement of the left hand (fig. 8-14), while the right hand exerts a pull on the fixed end of the wire. This is a secure tie, it is quickly made, and it uses only a short piece of wire.

Intermediate-Eye Tie

Use the intermediate tie to fasten standard barbed wire to eyes other than the top eye in screw pickets. Make it as shown in figure 8-15. This tie and the other ties described below require more time to make than the top-eye tie, and each uses several inches of wire. In making the intermediate-eye tie shown in figure 8-15, the following points are especially important:

1. The right hand reaches over the fixed wire and around the picket with the palm down. The left hand holds the fixed end for tension.

2. The loops are removed from the free end and wrapped around the picket.

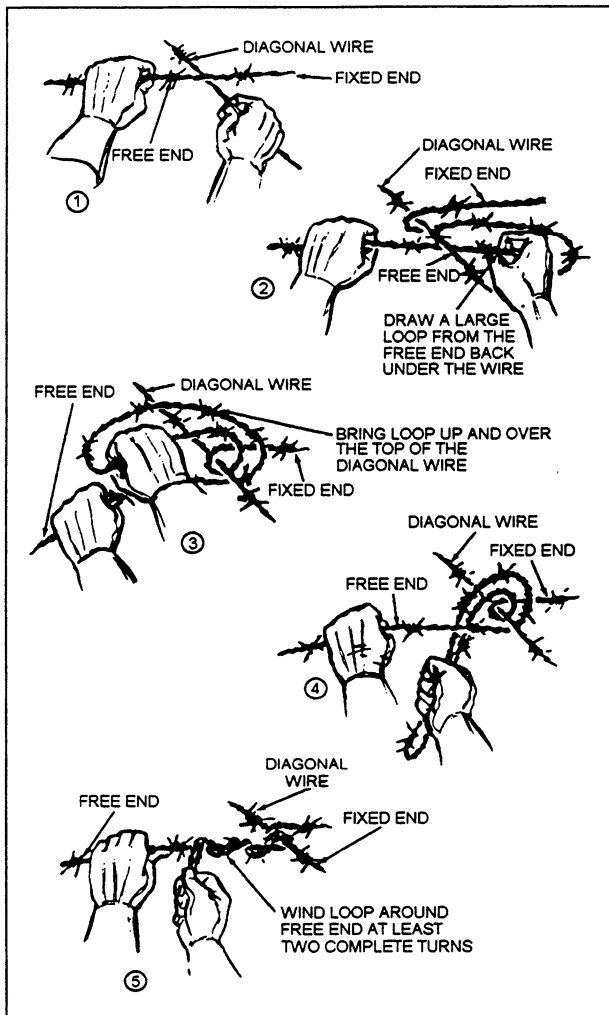


Figure 8-16.—Standard barbed-wire apron tie.

3. One side of the loop should pass above the eye and the other side below the eye.

Apron Tie

Use the apron tie whenever two wires that cross must be tied together. Tie it in the same reamer as the post tie except that a wire is substituted for the post (fig. 8-16).

Post Tie

Fasten standard barbed wire to wooden pickets or to the steel U-shaped picket with the post tie shown in figure 8-17. Wrap the wire tightly around the post to keep the barbs from sliding down. With the U-shaped picket, engage the wire wrapping in a notch in the picket.

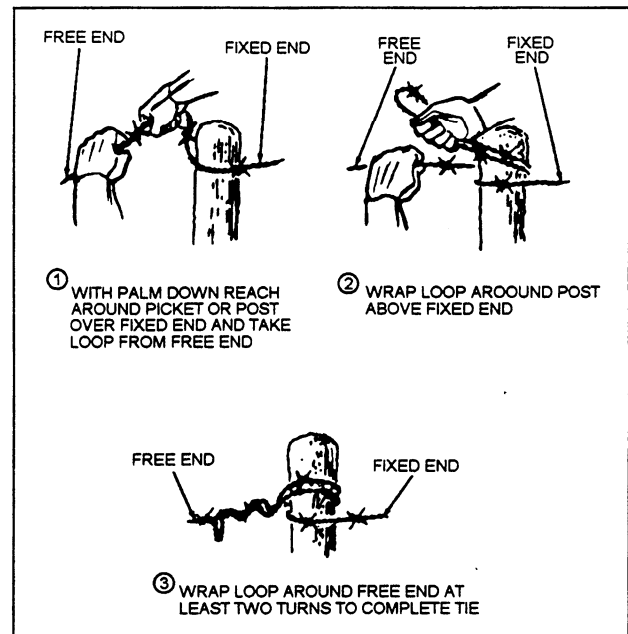


Figure 8-17.—Post tie.

This method is essentially the same as that of the intermediate-eye tie.

Barbed-Tape Splices

Connecting slots at each end of a 164-fbot reel provide a quick method of splicing reels of barbed tape. You can also splice barbed tape by interlocking the twisted barbs of two separate lengths, then completing the splice by twisting a short piece of wire to each end of the area where spliced.

INSTALLING WIRES

To install the wires, follow these steps:

1. Attach the end of the wire to the first anchor picket. This is the picket at the right end of a section of entanglement from the friendly side. Build fences from the right to the left as this makes it easier for a right-handed man to make the ties while facing toward the enemy.

2. Insert a bar in the reel and carry the reel 75 to 88 feet, allowing the wire to unreel from the bottom. Do this on the friendly side of the row of pickets to which the wire is to be tied.

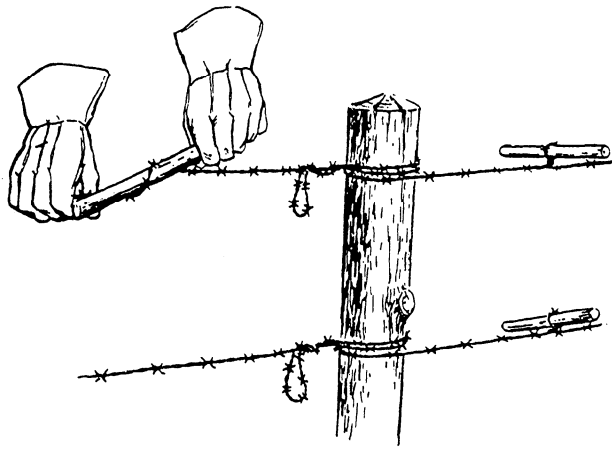


Figure 8-18.—Tightening wire by racking.

3. Put slack in the wire by moving back toward the starting point; then add the ties by two men leapfrogging each other. When available, assign two men to make the ties as the reel is unwound.

After a wire is installed, tighten it, if necessary, by racking with a driftpin or short stick (fig. 8-18). Do not rack the wires at ties or where they intersect other wires because this makes salvage of the wire very difficult. Fences are similarly racked to tighten them when they sag after having been installed for some time. Wires should be just taut enough to prevent them from being depressed easily by boards, mats, or similar objects thrown across them. When you stretch the wires too tightly, they are more easily cut by fragments. NEVER tighten barbed-steel tape by racking.

FOUR-STRAND CATTLE FENCE

The four-strand center section of a double-apron fence can be installed rapidly to obtain some obstacle effect. The aprons can be added later to develop it into a double-apron fence. In country where wire fences are used by farmers, obstacles in the form of four-strand cattle fences (fig. 8-19) will blend with the landscape. Their design should follow the local custom as closely as possible, usually wooden pickets at about 2- to 4-pace intervals with four horizontal strands of barbed wire fixed to them. Site them along footpaths and edges of fields or crops where they do not look out of place. When conditions permit, you may improve this fence by installing guy wires in the same manner as the diagonal wires of the

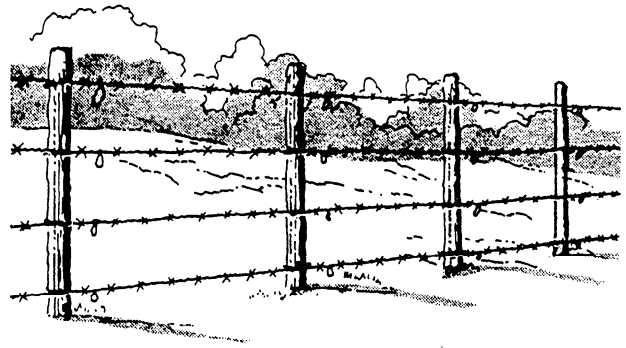


Figure 8-19.—Four-strand cattle fence as viewed from the enemy side.

double-apron fence. All longitudinal wires of this fence must start and end at an anchor picket.

Phase One

Use 8 men on short sections of this fence and up to 16 men on 984-foot sections. The two operations are (1) laying out and installing pickets and (2) installing wire.

Divide the working party into two groups of approximately equal size. The first group carries and lays out long pickets at 9.8-foot intervals along the center line of the fence. They begin and end the section with an anchor picket and include anchor pickets for guys, if needed. The second group installs the pickets.

Phase Two

As the first task is completed, move men individually to the head of the fence and organize them into teams of two or four men to install the wires. For four-man teams, two men carry the reel and two men make ties and pull the wire tight. For two-man teams, the wire must first be unrolled for 164 to 328 feet; then the men come back to the head of the work and make the ties, or the wire may first be made up into bobbins to be carried and unwound by one man, while the other man makes the ties. The first team installs the bottom fence wire and draws it tight and close to the ground. Succeeding teams install the next wires in order.

DOUBLE-APRON FENCE

There are two types of double-apron fence: the 4- and 2-pace fence and the 6- and 3-pace fence. The

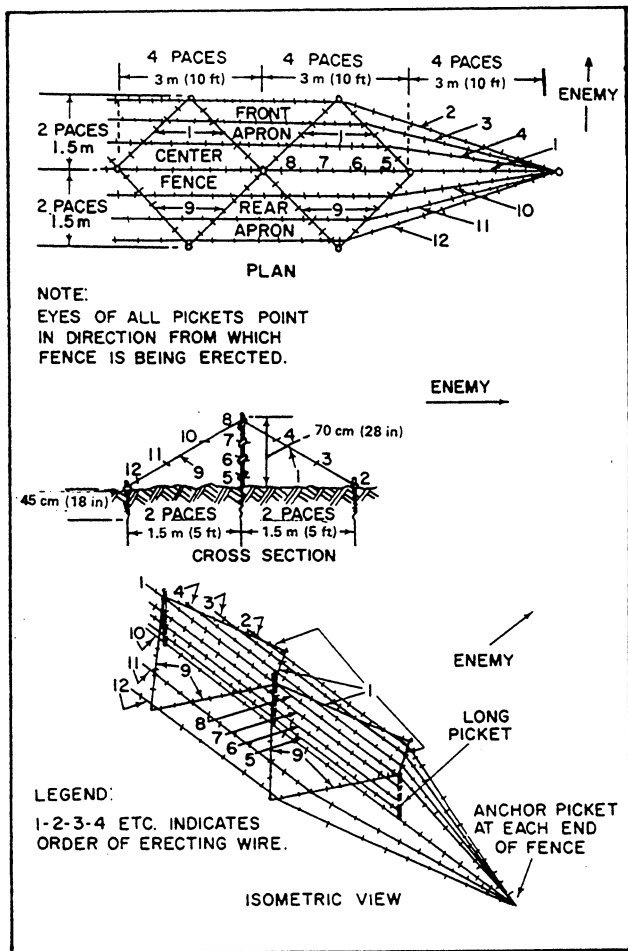


Figure 8-20.—Double-apron fence.

4- and 2-pace fence (fig. 8-20) is the better obstacle of the two and is the type more commonly used. In this fence, the center pickets are 4 paces apart and the anchor pickets are 2 paces from the line of the center pickets and opposite the midpoint of the space between center pickets. The 6- and 3-pace fence follows the same pattern with pickets at 6- and 3-pace intervals. For this fence, less material and construction time are required, but the obstacle effect is substantially reduced, because with the longer wire spans, it is easier to raise the lower wires and crawl over or under them. Except for picket spacing, the 4- and 2-pace and the 6- and 3-pace fences are identical. Only the 4- and 2-pace fence is discussed in detail.

A 984-foot section of either type of double-apron fence is a platoon task normally requiring 1 1/2 hours, assuming 36 productive men per platoon. There are two operations in building a double-apron fence: (1) laying out and installing pickets and (2) installing wire. The first operation is nearly completed before starting the second. The second operation is started as men become

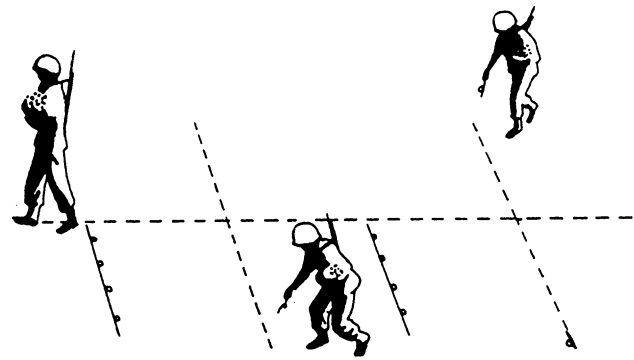


Figure 8-21.—Laying out anchor pickets,

available and the first operation has moved far enough ahead to avoid congestion. A platoon is normally assigned to build a 984-foot section.

Phase One

Divide the working party, if not organized in three squads, into three groups of approximately equal size. One squad lays out the long pickets along the center line of the fence at 4-pace intervals at the spots where they are to be installed and with their points toward the enemy. Another squad lays out the anchor pickets with points toward the enemy and positioned 2 paces each way from the center line and midway between the long pickets (fig. 8-21). The spacing is readily checked with along picket. The third squad installs all the pickets with the help of the two other squads, as the latter finishes the work of laying out the pickets. When installed, the lower notch or bottom eye of the long pickets should be approximately 4 inches off the ground to make passage difficult either over or under the bottom wires.

Phase Two

As the groups complete the first operation, they return to the head of the fence and begin installing wire. The order in which the wires are installed is shown in figure 8-20 and is further illustrated in figure 8-22. Take care to avoid having any of the men cutoff between the fence and the enemy. Divide the men into two- or four-man groups and have them proceed to install the wires in numerical order; that is, as soon as the men installing one wire have moved away from the beginning of the fence and are out of the way, the next wire should be started. Installation is as follows:

1. The No. 1 wire is the diagonal wire on the enemy side and is secured with a top-eye tie to all pickets. It is important to keep this wire tight.

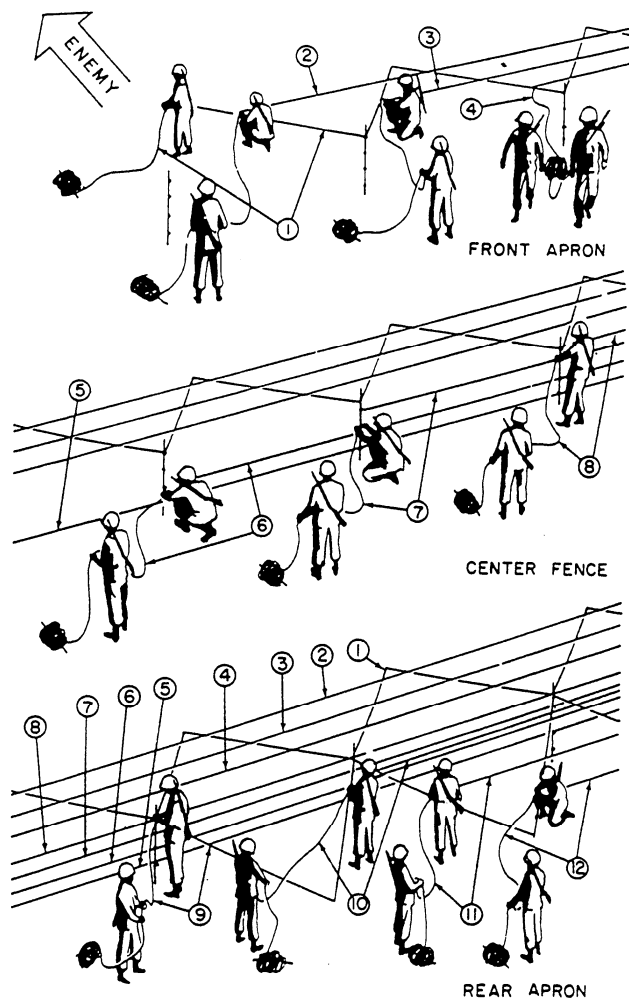


Figure 8-22.—Sequence of installing wire in a double-apron fence.

2. The No. 2 wire is the trip wire on the enemy side of the fence and is secured to both diagonals just above the anchor picket with the apron tie. This wire must be tight enough and close enough to the ground to make passage over or under the wire difficult.

3. The No. 3 wire is an apron wire on the enemy side of the fence. It is secured to the first diagonal wire, and thereafter to each alternate diagonal, and then to the last diagonal wire. The No. 4 wire is also an apron wire on the enemy side of the fence. It is secured to the first diagonal wire (No. 1), thereafter to the diagonal wires which are not tied to the No. 3 wire, and then to the last diagonal wire. Apron wire Nos. 3 and 4 are equally spaced along the diagonal wire.

4. The No. 5 wire is the first one that is not started from the end anchor picket. It is started at the first, long picket and ended at the last, long picket. It is secured

with the intermediate-eye tie and is stretched tightly to prevent passage over or under it.

5. Wire Nos. 6, 7, and 8 complete the center portion of the fence and are secured to the long pickets Nos. 6 and 7 with the intermediate-eye tie. They also start at the first and end at the last, long picket. No. 8 is secured with the top-eye tie. These wires (Nos. 6, 7, and 8) form the backbone of the fence and are drawn up tightly to hold the pickets in position.

6. Wire No. 9 is the diagonal apron wire on the friendly side of the fence and is secured with the top-eye tie to all pickets. Wire Nos. 10 and 11 are apron wires, and wire No. 12 is the trip wire on the friendly side of the fence. Wire No. 12 is installed in the same manner as wire No. 2.

7. If the fence is not satisfactorily tight when installed, wires are tightened by racking as described above.

STANDARD CONCERTINA FENCE

As an obstacle, in most situations, the triple standard concertina fence is better than the double-apron fence. The material for it weighs about 50 percent more, but it is erected with about one half of the man-hours. Every concertina fence is secured firmly to the ground by driving staples at intervals of not more than 6.6 feet. The staples are used on the single concertina fence and on the front concertina of the double and triple types. The two types of fence areas follow:

1. **SINGLE CONCERTINA.** This is one line of concertinas. It is erected quickly and easily but is not an effective obstacle in itself. It is used as an emergency entanglement or for the temporary closing of gaps between other obstacles. It is for such purposes that one roll of concertina may be habitually carried on the front of each vehicle in combat units.

2. **DOUBLE CONCERTINA.** This consists of a double line of concertinas with no interval between lines. The two lines are installed with staggered joints. As an obstacle, the double concertina is less effective than a well-emplaced, double-apron fence. It is used in some situations to supplement other obstacles in a band or zone.

TRIPLE STANDARD CONCERTINA FENCE

This fence consists of two lines of concertinas serving as a base, with a third line resting on top, as

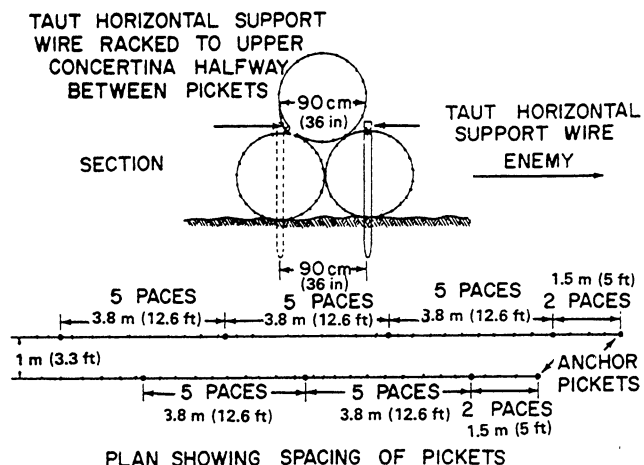


Figure 8-23.—Triple standard concertina fence.

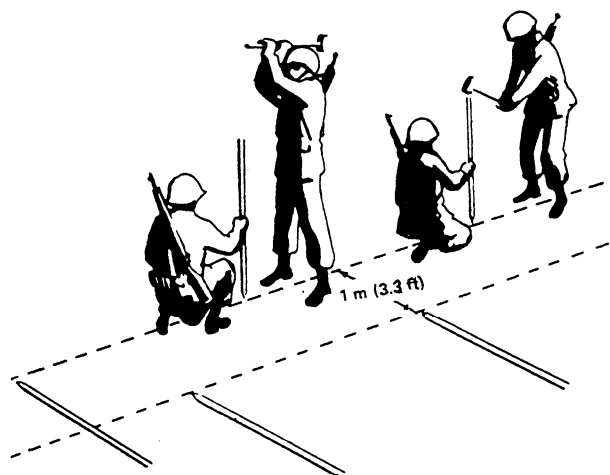


Figure 8-25.—Installing front-row pickets for triple concertina fence.

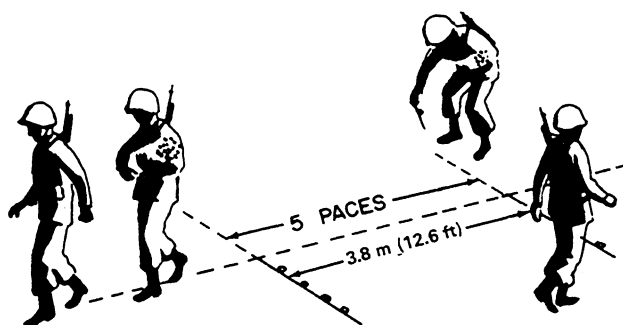


Figure 8-24.—Laying out long pickets for triple concertina fence.

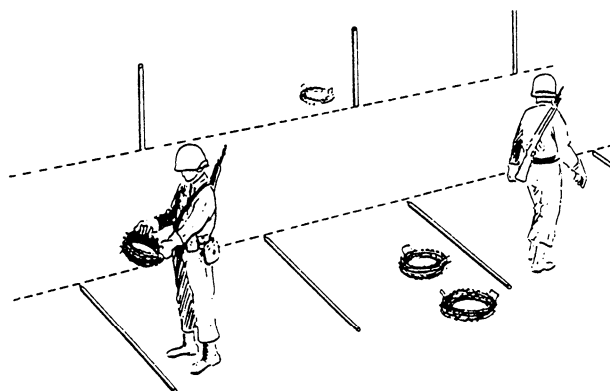


Figure 8-26.—Laying out concertina.

shown in figure 8-23. All lines are installed with staggered joints. Each line is completed before the next is started, so a partially completed concertina entanglement presents some obstruction. It is erected quickly and is difficult to cross, cut, or crawl through.

A 984-f60t section of this fence is a platoon task normally requiring less than 1 hour. There are two operations in building this fence: (1) carrying and laying out pickets and concertina rolls and installing concertina fence and (2) opening and installing concertinas.

Phase One

For the first operation, divide the working party into three groups of approximately equal size: one to lay out all concertina fence, one to install all concertina fence, and one to lay out all concertina rolls.

The first group lays out front-row long pickets of concertina fence at 5-pace intervals on the line of the fence (fig. 8-24) with points of pickets on line and pointing toward the enemy. The rear-row long pickets are then laid out on a line 3 feet to the rear and opposite the center of interval between the front-row long pickets. An anchor picket is laid out at each end of each line, 5 feet from the end long picket.

The second group installs pickets beginning with the front row (fig. 8-25). As in other fences, eyes of screw pickets are to the right. Concave faces of U-shaped pickets are toward the enemy.

The third group lays out concertinas along the rows of pickets (fig. 8-26). In the front row, one roll is placed at the third picket and one at every fourth picket thereafter. Sixteen staples accompany each front-row

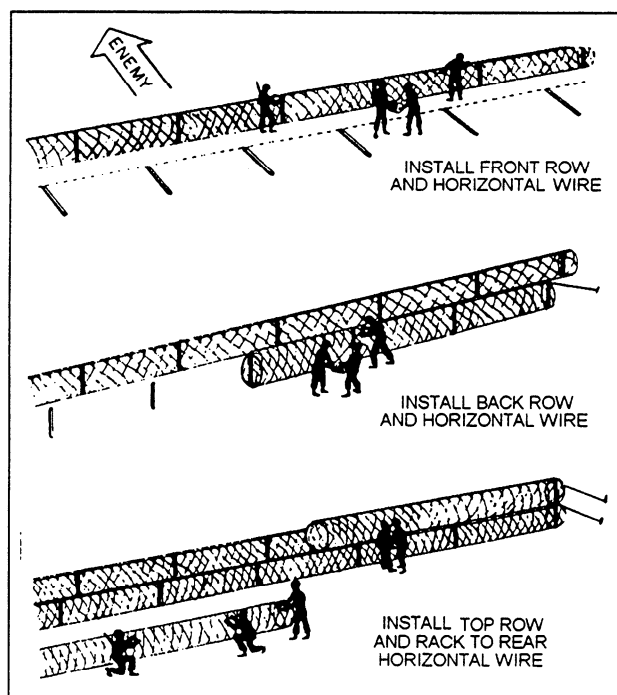


Figure 8-27.—Installing concertina.

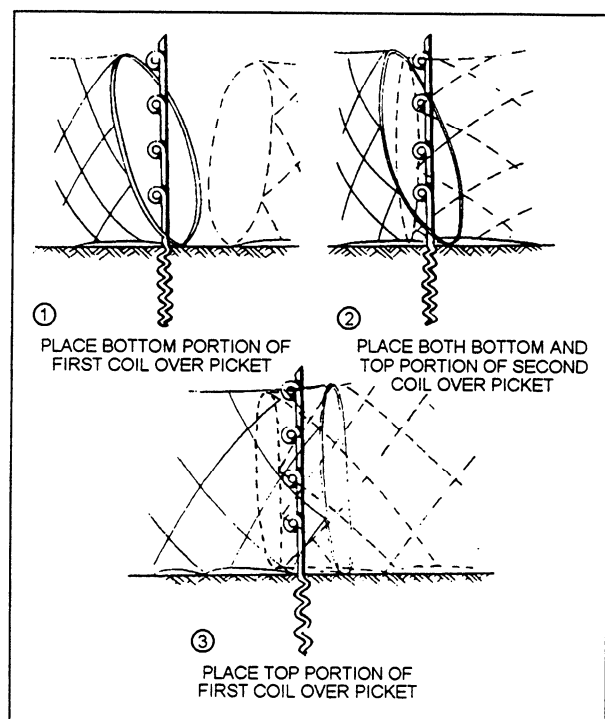


Figure 8-28.—Joining concertina.

concertina. In the second row, two rolls are placed at the third picket and two at every fourth picket thereafter. As each roll is placed in position, its binding wires are unfastened but are left attached to the hoop at one end of the roll.

Phase Two

As they complete the first operation, organize all men in four-man parties (fig. 8-27) to open and install concertinas, beginning at the head of the fence. The sequence shown in general in figure 8-27 is as follows:

1. Open the front-row concertinas in front of the double line of pickets and the other two in the rear.

2. Lift each front-row concertina, in turn, and drop it over the long pickets; then join concertina ends, as shown in figure 8-28.

3. Fasten the bottom of the concertina to the ground by driving a staple over each pair of end hoops: one over the bottom of the coil at each long picket and one at the one-half and one-fourth points of the 12.5-foot picket spacing. Securing the front concertina to the ground is essential and must be done before installing another concertina in the rear unless the enemy side of the entanglement is sure to be accessible later.

4. Stretch a barbed-wire strand along the top of each front row and fasten it to the tops of the long pickets, using the top-eye tie for screw pickets. Stretch these wires as tightly as possible to improve the resistance of the fence against crushing.

5. Install the rear-row concertina as described above for the front-row concertina.

6. Install the concertina in the top row (fig. 8-27), fastening the end hoops of 50-foot sections with plain, steel-wire ties. Begin this row at sections with plain, steel-wire ties. Begin this row at a point between the ends of the front and rear of the lower rows, thus breaking all end joints.

7. Rack the top concertina to the rear horizontal wire at points halfway between the long pickets. If there is safe access to the enemy side of the fence, similarly rack the top concertina to the forward horizontal wire.

LOW-WIRE ENTANGLEMENT

This is a 4- and 2-pace double-apron fence in which medium pickets replace long pickets in the fence center

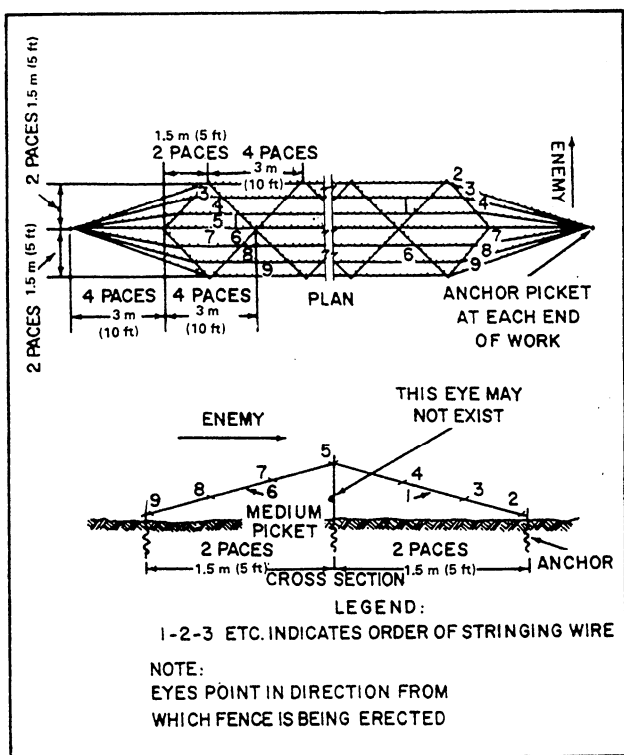


Figure 8-29.—Low-wire fence.

line (fig. 8-29). This results in omission of wire Nos. 6, 7, and 8, and in bringing all the apron and diagonal wires much closer to the ground, so passage underneath this fence is difficult. This fence may be used advantageously on one or both sides of the double-apron fence. The low-wire entanglement is used where concealment is essential. In tall grass or shallow water, this entanglement is almost invisible and is particularly effective as a surprise obstacle. However, a man can pick his way through this low-wire fence without much difficulty; therefore, for best results, it must be used in depth.

Except for the omission of three wires and the substitution of medium pickets, this fence is constructed in the same reamer as the double-apron fence.

HIGH-WIRE ENTANGLEMENT

This obstacle consists of two parallel 4-strand fences with a third 4-strand fence zigzagged between them to form triangular cells. With two rows of pickets, as shown in figure 8-30, the entanglement is classed as a belt; with one or more additional rows of fences and triangular cells, it is a band. To add to the obstacle effect, install front and rear aprons and place spirals of loose wire in the triangular cells.

A 984-foot section of high-wire entanglement with two rows of pickets, as shown in figure 8-30, is a platoon

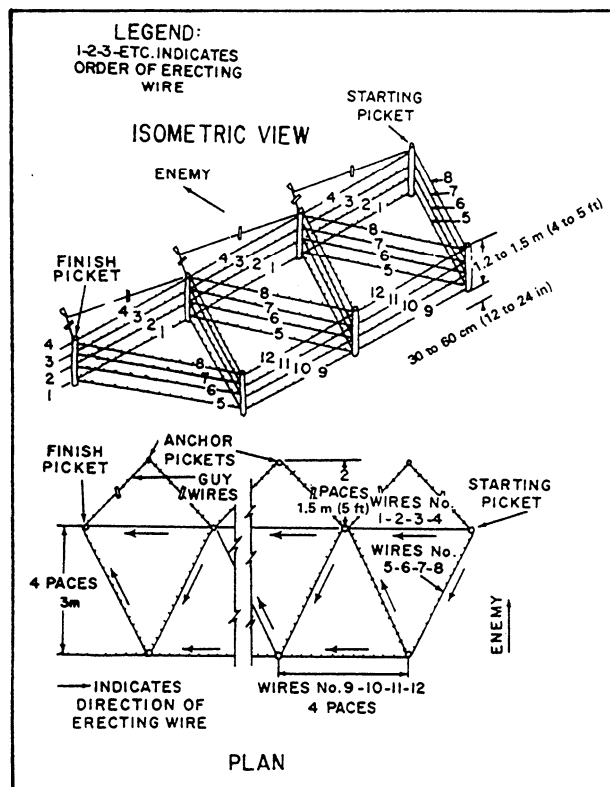


Figure 8-20.—High-wire entanglement.

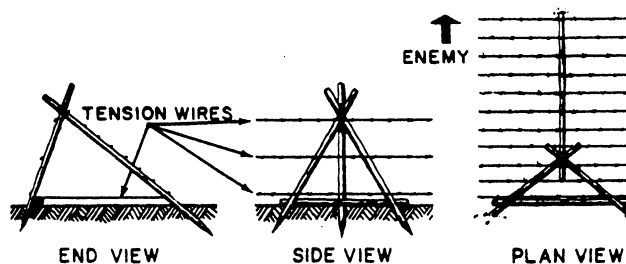


Figure 8-31.—Trestle apron fence.

task normally requiring about 2 hours, assuming 38 men per platoon. The two operations are laying out and installing pickets and installing wire.

Phase One

For this operation, divide the working party into two groups: two thirds of the men going to the first group and one third to the second. The first group carries and lays out pickets, front row first and at 10-foot intervals. Second-row pickets are laid out in a line 10 feet to the rear of the front row and spaced midway between them. The first group also lays out an anchor picket in line with each end of each 4-strand fence, 10 feet from the nearest long picket. If guys are needed, anchor pickets are also

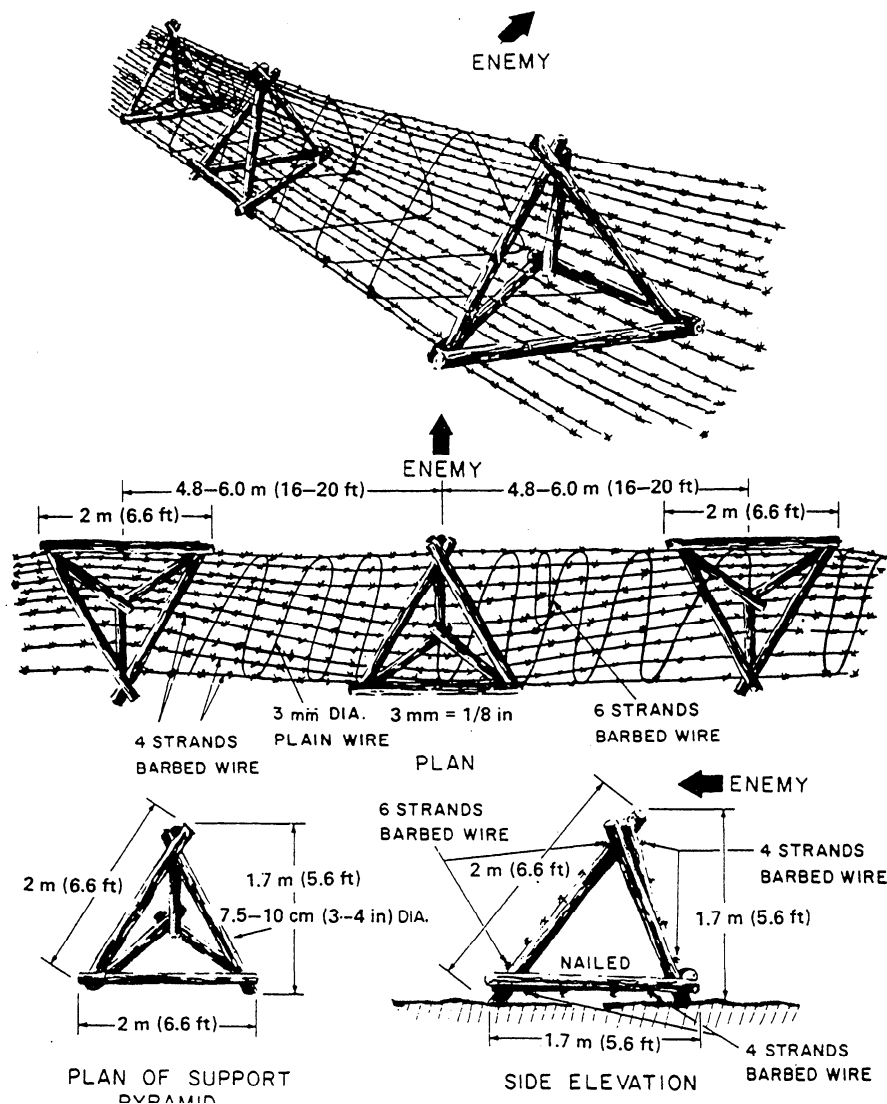


Figure 8-32.—Lapland fence.

laid out in lines 2 paces from the lines of the front and rear fences, opposite and midpoint of spaces between the long pickets. The second group installs front-row pickets, returns to the head of the fence, installs the rear row, and then installs the anchor pickets. When the first group finishes laying out pickets, they begin installing wire and help finish installing the pickets.

Phase Two

As the first task is completed, men move individually to the head of the fence and are organized into teams of two or four men to install wires in the same manner as for the 4-strand fence. The order of installation is as shown in figure 8-30, except if front guys are used, they are installed before the No. 1 wire; rear guys after the No. 12 wire. The lengthwise wires of each 4-strand fence begin and end at an anchor picket.

TRESTLE APRON FENCE

The trestle apron fence (fig. 8-3 1) has inclined crosspieces spaced at 15.7- to 19.7-foot intervals to carry longitudinal wires on the enemy side. The rear ends of the crosspieces are carried on triangular timber frames that are kept from spreading by tension wires on the friendly side. The crosspiece maybe laid flat on the ground for tying the longitudinal wires in place and then raised into position on the triangular frames. The frames are tied securely in place and held by the tension wires. The fence should be sited in such a way that it can be guyed longitudinally to natural anchorages and racked tight.

LAPLAND FENCE

Figure 8-32 shows the Lapland fence that can be used equally well on frozen or rocky ground and on bogs

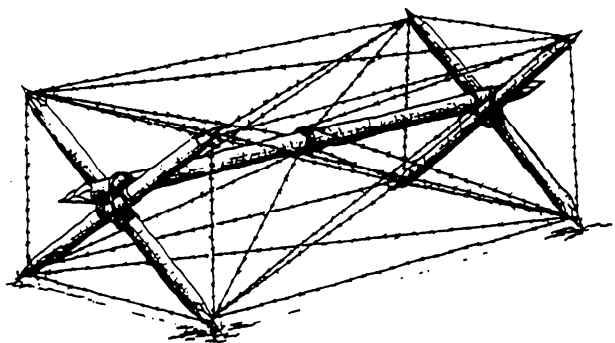


Figure 8-33.—Knife rest.

or marshland. This fence is wired with six strands of barbed wire on the enemy side, four strands on the friendly side, and four strands on the base. In snow, the tripods can be lifted out of the snow with poles or other means to reset the obstacle on top of newly fallen snow. On soft ground, the base setting of tripods and the base wires give enough bearing surface to prevent the obstacle from sinking.

PORTABLE, BARBED-WIRE OBSTACLES

Standard concertinas are readily moved and are well adapted for the temporary closing of gaps or lanes, or for adding rapidly to the obstacle effect of fixed barriers, such as the double-apron fence. Other portable, barbed-wire obstacles are described below.

Spirals of Loose Wire

By filling open spaces in and between wire entanglements with spirals of loose wire, the obstacle effect is substantially increased. Men are tripped, entangled, and temporarily immobilized. Spirals for such use are prepared as follows:

1. Drive four 3.3-foot posts in the ground to form a diamond 3.3 by 1.6 feet.
2. Wind 246 feet of barbed wire tightly around the frame. Start winding at the bottom and wind helically toward the top.
3. Remove the wire from the frame and tie it at quarter points for carrying or hauling to the site where it is to be opened and used. One spiral weighs less than 20 pounds and a man can carry three or more of them by stepping inside the coils and using wire handles of the type furnished with the standard concertina.
4. If spirals are needed in large quantities, mount the diamond-shaped frame on the winch of a truck and use the winch to coil the wire.

Knife Rest

The knife rest (fig. 8-33) is a portable, wooden or metal frame strung with barbed wire. Use it wherever a readily removable barrier is needed; for example, at lanes in wire obstacles or at roadblocks. With a metal

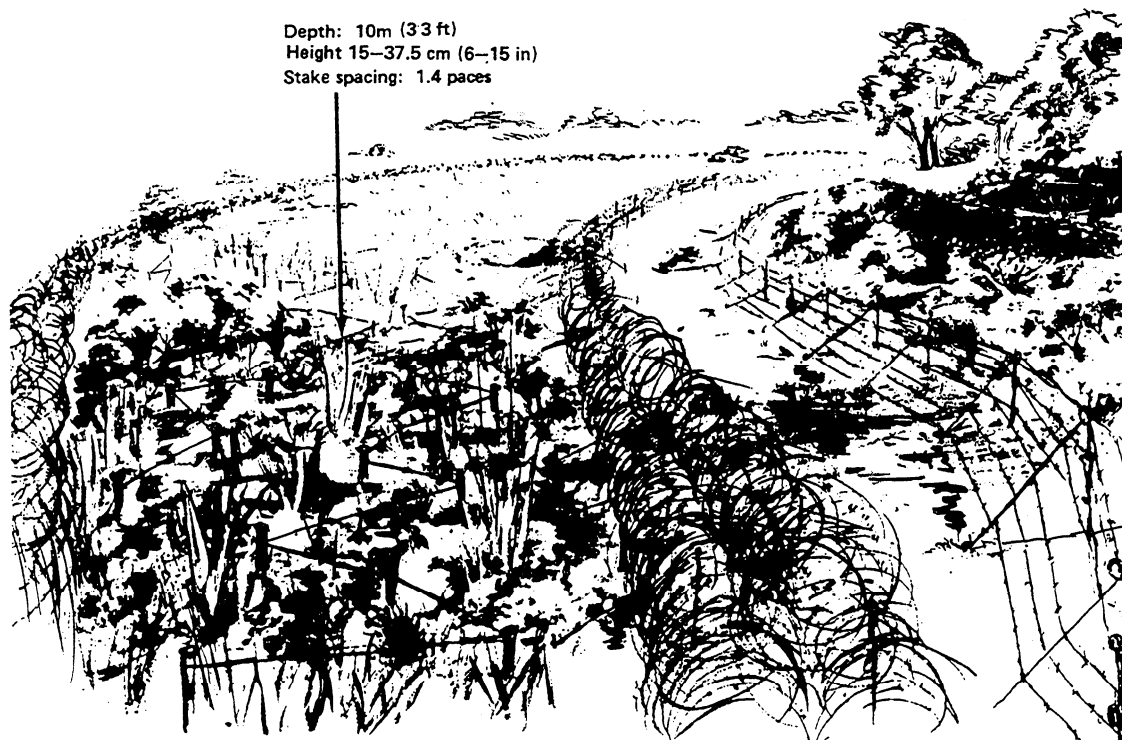


Figure 8-34.—Tanglefoot in barrier system.

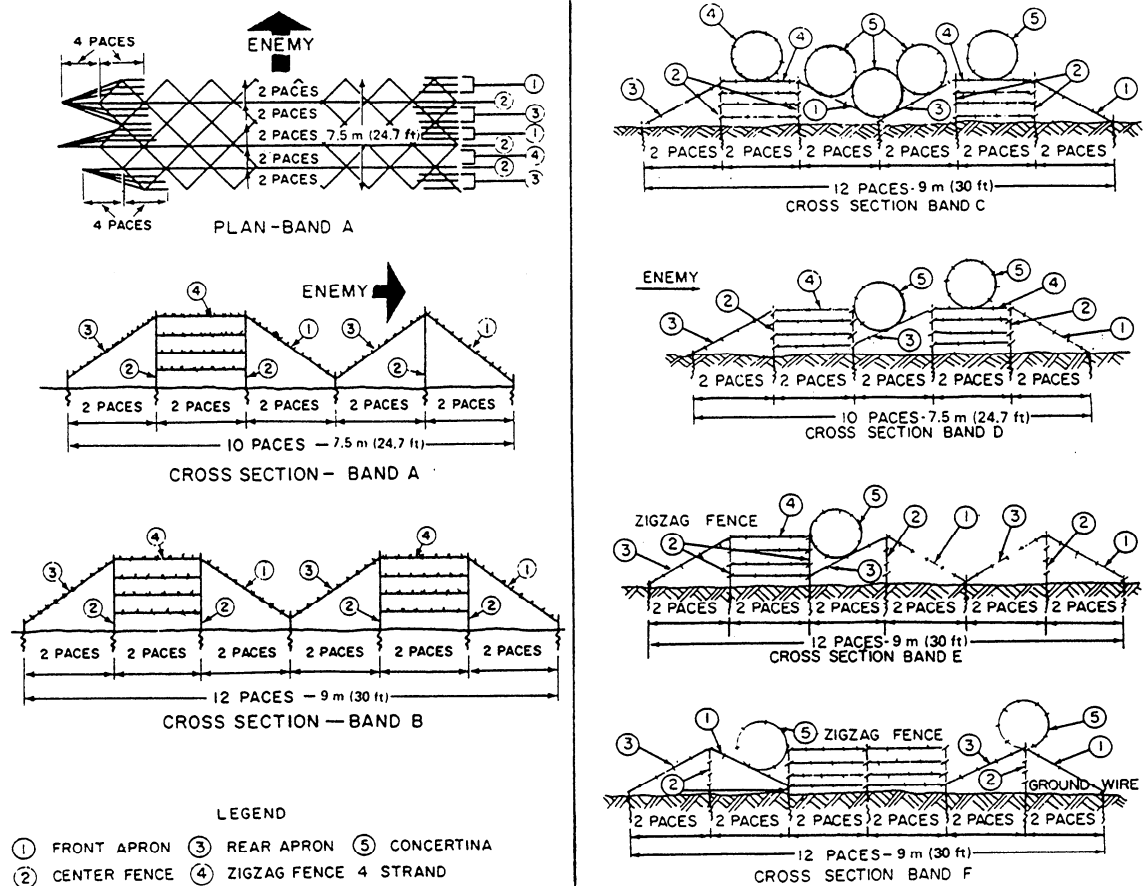


Figure 8-35.—Combination bands of wire obstacles.

frame, you can use it as an effective underwater obstacle in beach defense. Knife rests are normally constructed with 9.8 to 16.4 feet between cross members. They should be approximately 3.3 feet high. The cross members must be firmly lashed to the horizontal member with plain wire. When placed in position, knife rests must be fixed securely.

Trip Wires

Immediately after a defensive position is occupied and before an attempt is made to erect protective wire, place trip wires just outside of grenade range, usually 98 to 131 feet. These wires should stretch about 9 inches above the ground and be fastened to pickets at not more than 16.4-foot intervals. Conceal them in long grass or crops on a natural line, such as the side of a path or the edge of a field. Place the trip wires in depth in an irregular pattern.

Tanglefoot

Use tanglefoot (fig. 8-34) where concealment is essential and to prevent the enemy from crawling between fences and in front of emplacements. Use the obstacle in a minimum depth of 32.8 feet. Space the

pickets at irregular intervals of 2.5 to 10 feet. The height of the barbed wire should vary between 9 and 30 inches. Site tanglefoot in scrub, if possible, using bushes as supports for part of the wire. In open ground, use short pickets. Control the growth of grass to help prevent the enemy from secretly cutting lanes in, or tunneling under, the entanglement.

COMBINATION BANDS

The high-wire entanglement may be built with additional rows of fences and triangular cells to form bands of any desired depth, or it may be made more effective by adding front and rear aprons. Other types of fences may be combined in bands to form obstacles that are more difficult to breach than a single belt. Portable, barbed-wire obstacles may be added as described previously. The construction of bands of various types is desirable because this makes it difficult for the enemy to develop standard methods of passage. It also allows for fitting the obstacles to the situation with the time and materials available. Six different types of effective combination bands are shown in figure 8-35. Other variations can be developed readily.

BASIC CONSIDERATIONS

Barbed-wire obstacles are constructed primarily from issue materials; thus both logistical and construction estimates are involved. Table 8-1 gives weights, lengths, and other data required for estimating truck transportation and carrying party requirements. Table 8-2 gives the material and labor requirements for construction of various wire entanglements. Table 8-2 is based on daylight work; for nightwork the man-hours must be increased 50 percent.

REQUIREMENTS FOR A DEFENSIVE POSITION

Table 8-2 gives quantities and weights of material per linear foot of entanglement. When a layout to scale can be developed, the lengths of the various types of entanglements are scaled and the quantities and weights are computed. When a scaled layout cannot be prepared, the rule-of-thumb method may be used for estimating the required lengths of tactical- and protective-wire entanglements. If the length of front is taken as the

straight-line distance between limiting points, the rules are as follows:

1. The length of tactical-wire entanglement is 1.25 times the length of the front, times the number of belts, regardless of the size of the unit involved.
2. The length of protective-wire entanglement for a defensive position is five times the length of the front being defended, times the number of belts. Since protective wire encircles each platoon area of a command, the protective-wire entanglement for units is 2.5 times the average platoon frontage, times the number of platoons involved.
3. Supplementary wire in front of the FEBA is used to breakup the line of tactical entanglements. Its length is 1.25 times the unit's frontage, times the number of belts. The length of the supplementary-wire entanglement behind the FEBA is approximately equal to 2.5 times the distance from the FEBA to the rearmost reserve unit, times the number of belts. This rule of thumb is adequate for all units.